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EXAMINER	
HIRL, JOSEPH P	

ART UNIT	PAPER NUMBER
2129	

DATE MAILED: 07/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/735,934	NUGENT, ALEX	
	Examiner	Art Unit	
	Joseph P. Hirl	2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *A*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to an AMENDMENT entered May 23, 2006 for the patent application 10/735,934 filed on December 15, 2003.

2. The First Office Action of April 24, 2006 is fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claims 1-20 are pending in this application.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 15 and 19 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The "semi-conducting structures" have not been distinctively pointed out to enable one of ordinary skill to know or use the invention. It is not known whether these

are pure semi-conductors, or are doped, or what the intended use or benefits of semi-conducting structures over purely conducting structures are to be considered.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
> b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 9-10, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by McHardy et al. (US Patent 5,315,162, herein referred to as **McHardy**). Examiner suggests applicant review the entire teaching of McHardy, as its entire teachings have been relied upon.

Claim 1

McHardy anticipates a physical neural network (**McHardy,** C 1-6, particularly C 1, L 8-10; also C 2, L 45-54), a dipole-induced comprising a connection network (neural networks are inherently a connection network, as proper operation requires numerous weighted connections and other requirements) comprising a plurality of molecular conducting connections suspended in a solution within a connection gap (**McHardy,** C 3, L 43-45; Fig. 1) formed between at least one input electrode and at least one output electrode (**McHardy,** C 1-6, particularly C 1, L 44 through C 2, 54 where it discusses the

roles of the anode and the cathode), wherein at least one molecular connection of said plurality of molecular conducting connections can be strengthened or weakened according to an application of an electric field across said connection gap (**McHardy,** C 1-6, particularly C 1, L 44 through C 2, 54; also C 3, L 44 through C 4, L 7); strengthening or weakening corresponds to the amount of whiskers present in the interconnect channel, likewise the conductivity of that channel) and a plurality of physical synapses formed from said molecular conducting connections of said connection network (**McHardy,** C 1-6, particularly C 2, L 45-54).

Claim 9

McHardy anticipates the physical neural network of claim 1 wherein said at least one input electrode comprises a pre-synaptic electrode and said at least one output electrode comprises a post-synaptic electrode (**McHardy,** C 1-6, particularly C 3, L 44-62).

Claim 10

McHardy anticipates the physical neural network of claim 9 wherein a resistance of said molecular conducting connections bridging said at least one pre-synaptic electrode and said at least one post-synaptic electrode is a function of a prior electric field across said at least one pre-synaptic electrode and said at least post-synaptic electrode (**McHardy,** C 1, L 29 through C 2, L 4, where it discusses Bernard Widrow's "memistor's" capability to regulate resistance [it does this through the application of an electric field] and also immediately

following this discussion where it describes the process of metal migration, and how metallic whiskers grow to create an ohmic [resistive] contact between electrodes when a DC voltage is applied, the whiskers being the molecular conducting connections)

Claim 14

McHardy anticipates the physical neural network of claim 1 wherein said molecular electrically conducting connections comprise molecular electrically conducting structures suspended and free to move about within said solution, said solution comprising a non-electrically conducting solution. (**McHardy,** C 6, L 30-46; non-electrically conducting solution is described therein as the multi-layer thin film technology utilizing polymer dielectrics)

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 2-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy as applied to claim 1 above, and further in view of Gorelik (US Patent 5,864,835, herein referred to as **Gorelik**).

Claim 2

McHardy fails to teach wherein the physical neural network further comprises a gate located adjacent said connection gap, insulated from electrical contact by an insulation layer.

Gorelik teaches wherein the physical neural network further comprises a gate located adjacent said connection gap, insulated from electrical contact by an insulation layer (**Gorelik**: C 8 L 54 through C 9, L 35).

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Gorelik's semiconducting method of an approximation to an artificial biological neuron with this insulation layer so as to maintain charge within the charge carrying layer indefinitely, thus allowing minimal leakage. (**Gorelik**: C 8 L 54 through C 9, L 35) Combining the electrochemical synapse with a semiconducting signaling device allows for greater flexibility in the application of the physical neural network, where it is to be implemented in different environments for different needs of fault-tolerance or physical structure or electrical requirements.

Claim 3

McHardy teaches wherein the gate of the physical neural network of claim 2 is connected to logic circuitry which can activate or deactivate individual physical synapses among said plurality of physical synapses (**McHardy**: C 1-6, particularly C 4, L 55 through C 5, L 9; some control mechanism is inherent to controlling this 'controlled forgetfulness' as applied to 'specific synaptic connections').

Claim 4

McHardy teaches wherein the gate of the physical neural network of claim 2 is connected to logic circuitry which can activate or deactivate groups of physical synapses of said plurality of physical synapses. (**McHardy**: C 1-6, particularly C 4, L 55 through C 5, L 9; some control mechanism is inherent to controlling this 'controlled forgetfulness' as applied to a 'low level back bias to all connections,' constituting a group).

Claim 5

McHardy fails to teach that the molecular conducting connections comprise semiconducting molecular structures. They are purely conducting structures in McHardy.

Gorelik teaches wherein the molecular conducting connections comprise semiconducting molecular structures (**Gorelik**: C 8 L 54 through C 10, L 63, where it discusses the charge carrying semiconductor device, which comprises semi-conducting molecular connections).

It would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's and Gorelik's invention for the reasons stated above (section: **Regarding claim 2**)

Claim 6

McHardy fails to teach that the semi-conducting molecular structures comprise semi-conducting nanotubes.

Gorelik teaches wherein the semi-conducting molecular structures comprise semi-conducting nanotubes (**Gorelik**: C 8 L 54 through C 10, L 63, where it discusses the charge carrying semiconductor device, which comprises semi-conducting molecular connections).

It would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's and Gorelik's invention for the reasons stated above (section: **Regarding claim 2**)

Claim 7

McHardy fails to teach that the semi-conducting molecular structures comprises semi-conducting nanowires.

Gorelik teaches wherein the semi-conducting molecular structures comprise semi-conducting nanowires (**Gorelik**: C 8 L 54 through C 10, L 63, where it discusses the charge carrying semiconductor device, which comprises semi-conducting molecular connections).

It would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's and Gorelik's invention for the reasons stated above (section: **Regarding claim 2**)

Claim 8

McHardy fails to teach that the semi-conducting molecular structures comprise semi-conducting nanoparticles. They are purely conducting structures in McHardy.

Gorelik teaches wherein the semi-conducting molecular structures comprise semi-conducting nanoparticles. (**Gorelik**: C 8 L 54 through C 10, L 63, where it discusses the charge carrying semiconductor device, which comprises semi-conducting molecular connections. Nanoparticles are the atoms and molecules maintaining the connections at the nanometer scale, such as the atoms at the border of the n-type and p-type wells common in semi-conducting devices).

It would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's and Gorelik's invention for the reasons stated above (section: **Regarding claim 2**)

Claim Rejections - 35 USC § 103

10. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy as applied to claims 1 and 9 above, and further in view of Nunally (US Patent 5,615,30, herein referred to as **Nunally**).

Claim 11

McHardy fails to teach that the physical neural network wherein at least one generated pulse from said at least one pre-synaptic electrode and at least one generated pulse from said at least one post-synaptic electrode is determinative of synaptic update values thereof

Nunally teaches that at least one generated pulse from said at least one presynaptic electrode and at least one generated pulse from said at least one post-synaptic electrode is determinative of synaptic update values thereof (**Nunally**: C 1-7, particularly C 4, L 58 through C 5, L 8).

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Nunally's pulse driven training mechanism to be able to update vast amounts of synaptic weights of the network asynchronously with little computational requirements (**Nunally**: C 1, L 53-67).

Claim 12

McHardy fails to teach the neural network of claim 9 wherein a shape of at least one generated pulse from said at least one pre-synaptic electrode and at least one generated pulse from said at least one post-synaptic electrode is determinative of synaptic update values thereof

Nunally teaches a shape of at least one generated pulse from said at least one pre-synaptic electrode and at least one generated pulse from said at least one postsynaptic electrode is determinative of synaptic update values thereof. (Nunally: C 1-7, particularly C 2, L 40-46 as well as C 4, L 1-21).

It would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's and Nunally's invention for the reasons stated above (section: Regarding claim 12)

Claim 13

McHardy fails to teach an adaptive neural network which is trainable based on said at least one generated pulse across said at least one pre-synaptic electrode and at least one generated pulse across said at least one post-synaptic electrode.

Nunally teaches an adaptive neural network which is trainable based on said at least one generated pulse across said at least one pre-synaptic electrode and at least one generated pulse across said at least one post-synaptic electrode (**Nunally**: C 1-7, particularly C 4, L 58 through C 5, L 8).

It would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's and Nunally's invention for the reasons stated above (section: Regarding claim 12)

Claim Rejections - 35 USC § 103

11. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy as applied to claims 1 above, and further in view of Widrow (US Patent 3,222,654, herein referred to as **Widrow**).

Claim 16

McHardy fails to teach the physical neural network of claim 1 wherein a variable increase in a frequency of said electrical field across said connection gap strengthens said molecular conducting connections thereof.

Widrow teaches the ability of the memistor to be used as a multiplier or a linear modulator with the appropriate addition of copper circuitry. (**Widrow**: C 10, L 65 through C 11, L 10) An increase in frequency f, corresponds to the increase in the connection gap strength. Changing the frequency of the alternating current is still within the scope of the disclosed alternating current of Widrow, which is in direct correlation to the rate of deposition of the electroplating.

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Widrow's method of electrochemical plating. McHardy can be seen as a closer approximation to the current state of the art offering miniaturization and thus the ability to use many of these neurons in parallel with little worry for space constraint.

Claim Rejections - 35 USC § 103

12. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy, in view of Gorelik and in further view of Widrow.

Claim 17

McHardy teaches a physical neural network (**McHardy**: C 1-6, particularly C 1, L 8-10; also C 2, L 45-54), comprising:

a dipole induced connection network (neural networks are inherently a connection network, as proper operation requires numerous weighted connections and other requirements) comprising a plurality of molecular conducting connections suspended in a solution within a connection gap (**McHardy**: C 3, L 43-45; Fig. 1) formed between at least one input electrode and at least one output electrode (**McHardy**: C 1-6, particularly C 1, L 44 through C 2, 54 where it discusses the roles of the anode and the cathode), wherein at least one molecular connection of said plurality of molecular conducting connections can be strengthened or weakened according to an application of an electric field across said connection gap (**McHardy**: C 1-6, particularly C 1, L 44 through C 2, 54; also C 3, L 44 through C 4, L 7; strengthening or weakening corresponds to the amount of whiskers present in the interconnect channel, likewise the conductivity of that channel) a plurality of physical synapses formed from said molecular conducting connections of said connection network (**McHardy**: C 1-6, particularly C 2, L 45-54).

McHardy fails to teach wherein the physical neural network comprises a gate located adjacent said connection gap, insulated from electrical contact by an insulation layer, and that the physical neural network wherein a variable increase in a frequency of said electrical field across said connection gap strengthens said molecular conducting connections thereof.

Gorelik teaches wherein the physical neural network further comprises a gate located adjacent said connection gap, insulated from electrical contact by an insulation layer (**Gorelik**: C 8 L 54 through C 9, L 35).

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Gorelik's semiconducting method of an approximation to an artificial biological neuron with this insulation layer so as to maintain charge within the charge carrying layer indefinitely, thus allowing minimal leakage. (**Gorelik**: C 8 L 54 through C 9. L 35) Combining the electrochemical synapse with a semiconducting signaling device allows for greater flexibility in the application of the physical neural network, where it is to be implemented in different environments for different needs of fault-tolerance or physical structure or electrical requirements.

Widrow teaches the ability of the memistor to be used as a multiplier or a linear modulator with the appropriate addition of copper circuitry. (**Widrow**: C 10, L 65 through C 11, L 10) An increase in frequency f, corresponds to the increase in the connection gap strength. Changing the frequency of the alternating current is still within the scope of the disclosed alternating current of Widrow, which is in direct correlation to the rate of deposition of the electroplating.

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Widrow's method of electrochemical plating. McHardy can be seen as a closer approximation to the current state of the art offering miniaturization and thus the ability to use many of these neurons in parallel with little worry for space constraint.

Claims 18, 19

McHardy teaches wherein the molecular electrically conducting connections comprise molecular electrically conducting (semi-conducting) structures suspended within a non conducting solution. (**McHardy** : C 6, L 30-46; non-electrically conducting solution is described therein as the multi-layer thin film technology utilizing polymer dielectrics)

Claim Rejections - 35 USC § 103

13. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over McHardy, in view of Gorelik and in further view of Widrow, and in further view of Nunally.

Claim 20

McHardy teaches a physical neural network (**McHardy**: C 1-6, particularly C 1, L 8-10; also C 2, L 45-54), comprising:

a connection network (neural networks are inherently a connection network, as proper operation requires numerous weighted connections and other requirements) comprising a plurality of molecular conducting connections suspended within a connection gap (**McHardy**: C 3, L 43-45) formed between at least one input electrode and at least one output electrode (McHardy: C 1-6, particularly C 1, L 44 through C 2, 54 where it discusses the roles of the anode and the cathode), wherein at least one molecular connection of said plurality of molecular conducting connections can be strengthened or weakened according to an application of an electric field across said connection gap and said at least one pre-synaptic electrode and said at least one post-synaptic electrode (**McHardy**: C 1-6, particularly C 1, L 44 through C 2, 54; also C 3, L 44 through C 4, L 7; strengthening or weakening corresponds to the amount of whiskers present in the interconnect channel, likewise the conductivity of that channel)

a plurality of physical synapses formed from said molecular conducting connections of said connection network (**McHardy**: C 1-6, particularly C 2, L 45-54) and

wherein a resistance of said molecular conducting connections bridging said at least one pre-synaptic electrode and said at least one post-synaptic electrode is a function of a prior electric field across said at least one pre-synaptic electrode and said at least post-synaptic electrode (**Widrow**: C 1, L 29 through C 2, L 4, where it discusses Bernard Widrow's "memistor's" capability to

regulate resistance [it does this through the application of an electric field] and also immediately following this discussion where it describes the process of metal migration, and how metallic whiskers grow to create an ohmic [resistive] contact between electrodes when a DC voltage is applied, the whiskers being the molecular conducting connections)

McHardy fails to teach wherein the physical neural network comprises a gate located adjacent said connection gap, insulated from electrical contact by an insulation layer, and that the physical neural network wherein a variable increase in a frequency of said electrical field across said connection gap strengthens said molecular conducting connections thereof, and wherein the adaptive neural network is trainable based on said at least one generated pulse across said at least one pre-synaptic electrode and at least one generated pulse across said at least one post-synaptic electrode.

Gorelik teaches wherein the physical neural network further comprises a gate located adjacent said connection gap, insulated from electrical contact by an insulation layer (**Gorelik**: C 8 L 54 through C 9, L 35).

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Gorelik's semiconducting method of an approximation to an artificial biological neuron with this insulation layer so as to maintain charge

within the charge carrying layer indefinitely, thus allowing minimal leakage. (**Gorelik**: C 8 L 54 through C 9, L 35) Combining the electrochemical synapse with a semiconducting signaling device allows for greater flexibility in the application of the physical neural network, where it is to be implemented in different environments for different needs of fault-tolerance or physical structure or electrical requirements.

Widrow teaches the ability of the memistor to be used as a multiplier or a linear modulator with the appropriate addition of copper circuitry. (**Widrow**: C 10, L 65 through C 11, L 10) An increase in frequency f, corresponds to the increase in the connection gap strength. Changing the frequency of the alternating current is still within the scope of the disclosed alternating current of Widrow, which is in direct correlation to the rate of deposition of the electroplating.

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Widrow's method of electrochemical plating. McHardy can be seen as a closer approximation to the current state of the art offering miniaturization and thus the ability to use many of these neurons in parallel with little worry for space constraint.

Nunally teaches an adaptive neural network which is trainable based on said at least one generated pulse across said at least one pre-synaptic electrode

and at least one generated pulse across said at least one post-synaptic electrode (**Nunally**: C 1-7, particularly C 4, L 58 through C 5, L 8).

Being from the same field of endeavor, physical neurons (of artificial neural systems) and synapses thereof to mimic the behavior of biological neurons, it would have been obvious to one of ordinary skill at the time of applicant's invention to combine McHardy's electrochemical synapse which provides easy miniaturization of the vast amounts of neurons needed to simulate biological neurons with Nunally's pulse driven training mechanism to be able to update vast amounts of synaptic weights of the network asynchronously with little computational requirements (**Nunally**: C 1, L 53-67).

Response to Arguments

14. The rejection of claim 2 under 35USC §112, second paragraph is withdrawn.

15. Applicant's arguments filed on May 23, 2006 related to Claims 1-20 have been fully considered but are not persuasive.

Examiner's Note (EN): Applicant has not defined the term Nanotechnology. From the web @ www.answers.com/nanotechnology, the following definition was obtained:

Nanotechnology: The science and technology of building devices, such as electronic circuits, from single atoms and molecules.

From Nanotechnology web site created by Dr. Ralph Merkle, the statement is made that the "word nanotechnology has become very popular and is used to describe many types of research where characteristic dimensions are less than about 1,000 nanometers" (micron range). http:www.zyvex.com/nano/

Applicant has not defined "nanotechnology" related to a specific numeric scale. However, applicant has made the following size comparison @ specification page 6, lines 10-13:

> Microelectrical nano-sized components include transistors, resistors, capacitors and other nano-integrated circuit components. MEMS devices include, for example, micro-sensors, micro-actuators, microinstruments, micro-optics, and the like.

Such definition is entirely consistent with the above cited definitions/intent.

Person having ordinary skill in the art (PHOSITA) would be knowledgeable of the intent of the word "nanotechnology. Examiner will use this "intent" in the examination of this application. PHOSITA would also be knowledgeable of Neural Networks of which many textbooks and technical papers are available in the community, an example of which is the "Elements of Artificial Neural Networks" by Kishan Mehrotra et al and published by MIT in 1997.

Concerning the concept of "dipole", it is to be noted that the applicant merely mentions "dipole" in one short paragraph (0098) of the 93 page specification. PHOSITA, being knowledgeable in Electrical/Electroinic Engineering understands that when a static potential is applied (voltage), it comes as a dipole (two poles) with one pole at a higher potential than the paired pole. Such potential or voltage defines a vector field of electric field strength or of electric flux density (The Authoritative Dictionary of IEEE Standards and

Terms, page 362, column 1, lines 27-41). A dipole and an electric field are inherent with the application of voltage and fundamental to the art of Electrical/Electroinic Engineering. PHOSITA would also be knowledgable of such technology.

Concerning the term "solution," applicant has not defined this term in the specification but has used it to mean both the "answer" to a problem (specification, page 6, lines 2-4), a "liquid" or "solvent" (specification, page 89, lines 15-16) or both within the same sentence (specification, page 27, lines 1-4). At best the use of "solution" within the claims is confusing and as such and in the spirit of compact prosecution, the term "solution" is read through in the examination process with the exception of claims 14, 15, 18, 19.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment. The Applicant refers to paragraph 0022 of the specification which refers to the example of "semiconducting nanowires" (see last sentence of paragraph 0022). A semiconducting nanowire is a semi-conducting structure. Given that the Applicant's specification provides for plenty of references to nanowires, nanotubes, nanoparticles, and so forth, the Applicant submits that the claim(s) contains subject matter which was described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the invention(s), at the time the application was filed, had possession of the claimed Invention.

Examiner's response:

¶ 19. applies. Supporting disclosure must be in the specification.

Comments in the Remarks area do not represent disclosure of the application.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment. Applicant's amended claim 1 teaches a physical neural network based on molecular technology (e.g., nanotechnology), including a

connection network comprising a plurality of molecular conducting connections suspended in a solution within a connection gap formed between at least one input electrode and at least one output electrode, wherein at least one molecular connection of said plurality of molecular conducting connections can be strengthened or weakened according to an application of an electric field across said connection gap. C 3, L 42-45 of McHardy does not refer to such a connection network; neither does C 3, L43-45; C 1-6, particularly C1, L44 through C2, 54, or C 1-6, particularly C1, L44 through C Z, L54; C3, L44 through C 4, L 7 of McHardy. McHardy particularly does not teach a physical neural network based on nanotechnology.

Examiner's response:

¶ 19. applies. The claims and only the claims form the metes and bounds of the invention. Limitations appearing in the specification but not recited in the claim are not read into the claim. The Examiner has full latitude to interpret each claim in the broadest reasonable sense. PHOSITA would confirm that McHardy's neural networks are connection networks. Since metal migration in an electrochemical process related to electroplating is a building process that related to atoms and molecules (McHardy @ c1:46-47), McHardy anticipates the applicant's invention.

In reference to Applicant's argument:

Considerably more important, however, is a misunderstanding of the physical mechanism that is being used to construct artificial synapses. The Examiner has stated that "the entire teachings [of McHardy] have been relied upon". Based on this statement it Is clear that the Examiner has not understood the teachings outlined by Applicant's specification and claims. We will review the differences clearing order to clarify and distinguish the Applicant's invention. The synapse, as described by the Applicant's specification and claims, utilizes an electromechanical aggregation of nanoparticles by dipole-induced forces. For example, refer to paragraph [0098] of Applicant's specification where the Applicant indicates that "...a dipole should preferably be induced in the material when in the presence of an electric field"_ To this end, Applicant's claims have been amended to refer to clarify a "dipole-induced connection network" rather than simply a "connection network". The effect relies on an electrode gap with no pre-existing connection between the two terminals. When a voltage is applied across the terminals, an inhomogeneous electric field induces a dipole in nanoparticles suspended in the liquid near the electrode gap. The induced dipole in turn induces a force toward the direction of Increasing field gradient and draws the nanoparticles into the connection gap to form a connection. The effect DOES NOT rely on the formation of ions.

Examiner's response:

¶ 19. applies. "... an electromechanical aggregation of nanoparticles by dipole-induced forces" is not claimed in claim 1. Limitations appearing in the specification but not recited in the claim are not read into the claim.

In reference to Applicant's argument:

McHardy, by stark contrast, requires a "permanent interconnection forms an electrolytic path between the input terminal and output terminal. The permanent Interconnect has a small, but finite conductivity." (see Detailed Description, Paragraph 1 of McHardy). Note that this configuration does not describe the Applicant's invention because the Applicant does utilize a permanent interconnect. McHardy claims that "Preferably, the spacing between the input terminal 12 and output terminal 14 will be on the order of 5-10 microns." Again, this In stark contrast with the Applicant's invention, in which the connection gap distance is considerably less that 1 micron. Further, McHardy teaches the following;

> "The precipitation of copper occurs because of pH changes associated with parallel electrode reactions involving the water present in the electrolytic solution provided by the absorbed moisture. Under the influence of an applied voltage, the water reacts at the anode to yield oxygen and hydrogen ions (acid) and at the cathode to yield hydrogen gas and hydroxyl ions (base).
>
> The solubility of copper ions decreases as the pH rises, so that they remain in solution only in a narrow zone close to the anode. As the copper ions migrate into the more neutral electrolyte displaced away from the anode, the copper ions precipitate as the low-density oxide filaments. The spongy oxide product fills the narrow gap to the anode so that the filaments appear to grow directly from the anode.
>
> The copper oxide whiskers grow preferentially along pre-existing paths. This preferred growth path is believed to be due to the hygroscopic nature of copper oxide which would tend to enhance the absorption of moisture. Once a copper oxide whisker connects the two electrodes, the resistance falls progressively with time. This fact, coupled with the controlling Influence of pH, provides a capability for controlling whisker growth and removal."

It should be noted that the invention disclosed and claimed by the Applicant does not utilize an electrochemical process. The entire effect of McHardy requires the migration of metal ions. Note that ions cannot be used In Applicant's invention. If ions were used, electrophoresis would preferentially deposit the ions on either the anode or the cathode (depending on the ion charge). To demonstrate even more dramatically the difference between McHardy and the present invention, note that the Applicant has disclosed the use of an alternating electric field to be used across the electrode gap: "When an alternating voltage is applied to the electrodes, thin metallic fibers begin to grow on the electrode edge facing the gap." This should not be taken lightly, as a pure electrophoresis force, as described by McHardy, would fail completely when exposed to an alternating field since the particles would be attracted and repelled equally to both electrodes. This effect can be understood in light of a dipole-induced force, and it is such a force that can be utilized by the Applicant's invention.

Examiner's response:

¶ 19. applies. Limitations appearing in the specification but not recited in the claim are not read into the claim. PHOSITA asserts that nanotechnology includes dimensions in the micron range.

In reference to Applicant's argument:

Based on the foregoing, the Applicant submits that the rejection to claim 1 fails under the aforementioned prima facie anticipation test. That Is, McHardy falls to disclose each and every element in Applicant's claim 1. The Applicant reminds the Examiner that in order to succeed in a rejection to a claim under 35 U.S.C. 102 based on a cited reference, that cited reference (in this case, McHardy), must disclose each and every claim limitation of the rejected claim. If even one claim limitation, however minor, is missing from the cited reference, then the rejection falls under 35 U.S.C. 102. In the present rejection, McHardy does not teach a physical neural network based on nanotechnology as the term "nanotechnology" is taught by Applicant's invention. McHardy further does not teach nanometer-scale devices and components. McHardy also does not provide for any teaching of a dipole-induced connection network made up of neural connections formed in a solution. The Applicant therefore submits that the rejection to claim 1 under 35 U.S.C. 102 has been traversed. The Applicant respectfully requests withdrawal of the rejection to claim 1.

Examiner's response:

¶ 19. applies. Limitations appearing in the specification but not recited in the claim are not read into the claim. See above discussion related to McHardy's anticipation of nanotechnology. "Nanometer-scale devices and components" are not addressed in claim 1.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes the arguments presented above against the rejection to claim 1 apply equally against the rejection to claim 9. The language of C 3, L 44-62 of McHardy does not provide for any disclosure of a connection formed from dipole induced aggregation of nanoparticles. Additionally, McHardy points out that "preferably, the spacing between the input terminal 12 and output terminal 14 will be on the order of 5-10 microns". 5-10 microns are not nanometer-scale dimensions, and hence the entire citation of C 3, L 44-62 of McHardy fails to disclose nanotechnology as taught by Applicant's invention.

Examiner's response:

¶ 19. applies. Limitations appearing in the specification but not recited in the claim are not read into the claim. Above discussion apply. The language of "connection formed from dipole induced aggregation of nanoparticles " is not to be found in claims 1 or 9. PHOSITA's understanding of nanotechnology includes dimensions in the micron range.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes the arguments presented above against the rejection to claim 1 apply equally against the rejection to claim 10. Thus, as indicated above, McHardy does not teach, disclose or suggest nanotechnology as taught by Applicant's invention, but instead focuses on micron scale devices and components. McHardy does not provide any teaching of nanometer-scale devices or components. Additionally, McHardy does not provide any teaching of a connection formed from dipole induced aggregation of nanoparticles. Indeed, a connection forming from an electrochemical process is completely different than a dipole-induce force and results in completely different operating parameters

Applicant's claim 10 indicates a resistance of said molecular conducting connections bridging said at least one pre-synaptic electrode and said at least one post-synaptic electrode Is a coon of a prior electric field across said at least one pre-synaptic electrode and said at least post-synaptic electrode.

Examiner's response:

¶ 19. applies. Above discussions apply. PHOSITA asserts that nanotechnology includes dimensions in the micron range. The claims and only the claims form the metes and bounds of the invention. "Induced aggregation of nanoparticles" as a limitation is not cited in claims 1, 9, or 10. PHOSITA further asserts that resistance is equal to voltage divided by current. Hence if one places a potential across any electrodes, the resistance is a function of such voltage or electric field ... basic concepts of Electrical Engineering.

In reference to Applicant's argument:

C 1, L 29 through C 2, L 4 and the discussion of a "memistor" provides no disclosure, or teaching of a resistance, molecular conducting connections, one or more pre-synaptic electrodes, one or

more post-synaptic electrodes, and wherein the resistance that is a function or a prior-electric field, all in the context of a neural network based on nanotechnology. Instead, C 1, L 29 through C 2, L 4 of McHardy discloses the following:

> "An electrochemically regulated synapse known as the "Memistor" was developed in the 1960's by Bernard Widrow, as part of a network known as the "Adaline" network, as disclosed by B. Widrow, in the publication "Neural Network Theory, Past and Present," Paper presented at the DARPA Neural Network Study Symposium, Lincoln Labs, 1987. The Memistor is an electrochemical cell In which copper Is either plated on or deplated from a carbon rod. As a result of the controlled plating and deplating of copper, the resistance of the rod is continuously adjustable from 1-10 ohms. This provides a 10:1 range of synaptic "weights." The Memistor serves well from the standpoint of trainability, surviving numerous plating and deplating cycles. However, the "memistor does not lend itself to miniaturization and the device is not g1ractlcAl for large-scale networks.
>
> Metal migration Is an electrochemical process related to electroplating. Metal migration takes place between conductors in an active electronic circuit in the presence of a moisture film. Under the Influence of a DC voltage, metal ions dissolve from the positive conductor (the anode). The dissolved ions migrate through the moisture film (the electrolyte) and plate out on the negative conductor (the cathode). The deposit often takes the form of metallic whiskers which eventually reach the anode and create an ohmic contact.
>
> Metal migration has been observed with all of the metals commonly used In the electronics industry, but it occurs most readily with silver (see A. Derrnarderosian, "The Electrochemical Migration of Metals," Proc, 1978 Microelectronics Syrnp., 1,34-141, International Soc. for Hybrid Microelectronics, 1978). The minimum or "critical" voltage Vc required to grow metallic whiskers can range from a few millivolts to over 2 volts, depending on the metal and prevailing conditions surrounding the electronic circuit. Once Vc is exceeded, growth rates tend to increase linearly with (V- Vc) (see P. B. Price, et al., "On the Growth Properties of Electrolytic Whiskers," ACTA Met., 6, 1968). The initial contact resistance is typically in the range of 18° -106 ohms, but with continued whisker growth, the contact resistance falls several orders of magnitude."

It Is Interesting to note that McHardy indicates that the "memistor" does not lend itself to miniaturization (see bolded above). Thus the memistor described above is ill suited for applicability to nanotechnology-based neural networks. Thus, the Examiner's arguments that a "memistor" is capable of regulating resistance in the context of the nanotechnology-based neural network of Applicant's invention are incorrect, simply because nanotechnology involves "miniaturization". Additionally, the process of metal migration, and how metallic whiskers grow to create an ohmic resistance, etc.? also do not provide for any teaching of presynaptic and post-synaptic electrodes in the context of a nanotechnology-based neural network. The Applicant's invention requires the dipole-induced assembly of nanoparticles from a liquid suspension (not a moisture film) and does not utilize ions.

Examiner's response:

¶ 19. applies. Applicant has cited from the prior art a teaching of resistance. PHOSITA asserts that the Memistor inherently has molecular conducting connections cited further above. PHOSITA asserts that inherently

neurons of a neural network have both pre and post synaptic electrodes ... i.e. input and output of a circuit. PHOSITA has further established nanotechnology to include the scale of microns as discussed above. The comments related to Memistor implementation do no limited the use of the Memistor prior art since such limitations are not substantive to the cited claims. Applicant is reminded that the art of Nanotechnology spans the scale to the micron range. Memistor is miniaturization. Applicant's use of the term solution has been ignored based on the ambiguous use of the term in the specification. Use of ions by the Memistor is not a disqualifying feature. Subject claims are silent on "dipole-induced assembly of nanoparticles from a liquid suspension."

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes the arguments presented above against the rejection to claim 1 apply equally against the rejection to claim 14. C 6, L 30-46 of McHardy does not describe molecular electrically conducting connections comprise molecular conducting structures suspended within a non-electrically conducting solution. The solution of Applicant's claim 14 is utilized as the medium for forming Nan connections. Instead, C 6, L 3046 of McHardy indicates that the connections of McHardy made with plated through holes (see C 6, L 38-40 of McHardy). There Is no discussion in C 6, L 30-46 of McHardy of molecular electrically conducting connections comprise molecular conducting structures suspended within a non-electrically conducting solution. Multi-layer thin film technology and polymer dielectrics do not provide any teaching or disclosure of molecular electrically conducting connections comprise molecular conducting structures suspended within a non-electrically conducting solution. The Examiner has made a statement that is so without elaborating on how and why this is so. How is a polymer dielectric a liquid?

The Applicant also notes that claim 14 as amended teaches the following claim limitations: the physical neural network of claim 1 wherein said molecular electrically conducting connections comprise molecular electrically conducting structures suspended and free to move about within said solution, said solution comprising a non-electrically conducting solution. The feature "free to move about" is not disclosed by McHardy.

Examiner's response:

¶ 19. applies. Above discussions apply. PHOSITA asserts that conducting liquid solutions will conduct only for a period of time and will lose

conductivity as whisker growth takes place ... conductive material is no longer in a liquid solution ... As McHardy asserts @ c6:45-46: "The result is a combination of electrochemical synapses which can be used to provide a neural network."

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 apply equally against the rejection to claim 2 under 35 U.S.C. 103. Thus, as indicated earlier, McHardy does not disclose, teach or suggest nanotechnology as taught by Applicant's invention due to the fact that McHardy focuses on micron level components and fabrication techniques and in fact relies on an entirely different physical process to construct synaptic connections. Similarly, Gorelik does not provide any teaching of nanotechnology and more particularly, nanotechnology based physical neural networks. C 8 L 54 through C 9, L 35 of Gorelik in particular cited by the Examiner does not provide for any teach of nanotechnology. Instead, C 8 L 54 through C 9, L 35 of Gorelik teaches the use of CMOS technology and various (logic gates and semiconductor components commonly used in standard semiconductor fabrication processes, but does not provide for any teaching of manometer-scale components and manometer-scale device fabrication processes.

Additionally, the Examiner is incurred that the cited references are from the same field of endeavor, arguing that this field is physical neurons (of artificial neuron systems) and synapses to mimic the behavior of biological neurons. Based on the foregoing, the Applicant submits that the rejection to claim 2 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 2, including all of the claim limitations of the claim(s) from which claim 2 depends. Second, there is not a reasonable expectation of success for such a combination, particularly In light of the fact that neither Gorelik nor McHardy provide any teaching or suggestion of molecular technology, Including nanotechnology. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the Invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim Z under 35 U.S.C. g103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 6 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Semaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). PHOSITA asserts that the technology of Gorelik is compatible with the technology of McHardy in a scale that includes the micron range.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. IO2 apply equally against the rejection to claim 3 under 35 U.S.C. 103. Additionally, the Applicant submits that the arguments presented above against the rejection to claim 2 apply equally against the rejection to claim 3.

The Applicant submits that the rejection to claim 3 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill In the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 3, including all of the claim limitations of the claim(s) from which claim 3 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Gorelik nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology and especially dipole-induced aggregation of nanoparticles upon which the Applicant's claims are based. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 3 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Finally, it appears from the Examiner's comments that the Examiner has misunderstood the function of the gate and its role in activating and deactivating the synapse. The ability to control a connection with an external gate, as utilized by the Applicant's invention, has nothing to do with adapting the synaptic strength but rather turning the connections on or off. The adaptation of the connection is controlled by pre-and post-synaptic electrode activity. The gate is utilized in the context of a very large neural network to selectively deactivate certain connections so as to evolve network topologies, not connection weights. Where in McHardy is it shown that the synaptic elements can be both modified and selectively activated and deactivated? McHardy is simply concerned with the ability to weaken a connection element. The gate and semi-conducting particles, as described by the Applicant, is concern with tuning the connection on and off, but not update or modifying, the connection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner advises the applicant that since the prior art of McHardy can be used for each element of claim 3, there is no requirement to follow the format that the applicant asserted on pages 17:19-25 and page 18:1-14 of the applicant's response dated May 23, 2006. From the perspective of PHOSITA, activation and deactivation is simply a manner of operating a neural network with neurons. Further turning a connection on or off

is equivalent to an update or modification. Applicant is reminded that the Examiner has the obligation to interpret each claim in the broadest reasonable sense.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 apply equally against the rejection to claim 4 under 35 U.S.C. 103. Additionally, the Applicant submits that the arguments presented above against the rejection to claim 2 apply equally against the rejection to claim 4.

The ability to control a connection with an external gate, as utilized by the Applicant in the present invention, has nothing to do with adapting the synaptic strength but rather turning the connections on or off. The adaptation of the connection is controlled by pre-and post-synaptic electrode activity. The gate is utilized in the context of a very large neural network to selectively deactivate certain connections so as to evolve network topologies, not connection weights. Where in McHardy is it shown that the synaptic elements can be both modified and selectively activated and deactivated? McHardy is simply concerned with the ability to weaken a connection element. The gate and semi-conducting particles, as described by the Applicant, is concern with turning the connection on and off, but not updating or modifying, the connection.

The Applicant submits that the rejection to claim 4 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill 1n the art, to combine the reference teaching's as argued by the Examiner to teach each and every claim limitation of Applicant's claim 4, including all of the claim limitations of the claim(s) from which claim 4 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Gorelik nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 4 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner advises the applicant that since the prior art of McHardy can be used for each element of claim 3, there is no requirement to follow the format that the applicant asserted on pages 17:19-25 and page 18:1-14 of the applicant's response dated May 23, 2006. From the perspective of PHOSITA, activation and deactivation is simply a manner of operating a neural network with neurons. Further turning a connection on or off is equivalent to an update or modification. Examiner has not found the limitation "The gate is utilized in the context of very large neural network to selectively deactive certain connections so as to evolve topologies, not connection weights." in claim 4, 2 or 1. Examiner has not found the limitation The applicant is reminded that the Examiner has the obligation to interpret each claim in the broadest reasonable sense.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 apply equally against the rejection to claim 5 under 35 U.S.C. 103.

The Applicant submits that the rejection to claim 5 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 5, Including all of the claim limitations of the claim(s) from which claim 5 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Gorelik nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology and also the dipole-induced aggregation of nanoparticles. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the

motivation as to why one of skill in the art would be motivated to make such a combination, and further falls to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim Sunder 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

As a final note, it appears the Examiner has attempted to apply the neural node described by Gorelik to the synapse element described by McHardy. A neuron is not a synapse.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 7 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). Applicant is invited to

revisit The First Office Action, page 7, "Regarding claim 5" and note that there is no reference to the statement made by the Applicant regarding neural node and synapse element.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 apply equally against the rejection to claim 6 under 35 U.S.C. 103. The Applicant also submits that all of the arguments against the rejection to claim 5 apply equally to the rejection to claim 6.

The language reproduced from Gorelik provides absolutely no teaching or suggestion of nanotubes as taught by Applicant's invention. Nanotubes are a fundamental claim limitation of Applicant's claim 6. Where are nanotubes taught by Gorelik? Beyond this, it should also be noted that Gorelik is attempting to mimic a neuron and the applicant is describing a synapse element. A synapse is not a neuron.

The Applicant submits that the rejection to claim 6 fails under all three prongs of the aforementioned prima facie obviousness test. First, there Is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 6, including all of the claim limitations of the claims) from which claim 6 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Gorelik nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology. Third, there is simply no teaching of the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 6 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C, §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 8 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary.

Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). The applicant's specification treats "nanotubes, nanowires, etc." as nanoparticles (specification, page 77, line 3 and PHOSITA asserts such devices are as discussed above in the micron range. Hence the prior art as cited related to Gorelik applies. PHOSITA asserts that a synapse is part of a neuron.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 apply equally against the rejection to claim 7 under 35 U.S.C. 103. The Applicant also submits that all of the arguments against the rejection to claim 5 apply equally to the rejection to claim 7.

The language reproduced from Gorelik provides absolutely no teaching or suggestion of nanowires as taught by Applicant's invention. Nanowires are a fundamental claim limitation of Applicant's claim 7. Where are nanowires taught by Gorelik7 Beyond this, it should also be noted

that Gorelik is attempting to mimic a neuron and the applicant is describing a synapse element. A synapse Is not a neuron, The Applicant submits that the rejection to claim 7 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 7, including all of the claim limitations of the claim(s) from which claim 7 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Gorellk nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology. Third, there Is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, anti further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 7 under 35 U.S.C. §203(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 8 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what

individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Semaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). The applicant's specification treats "nanotubes, nanowires, etc." as nanoparticles (specification, page 77, line 3 and PHOSITA asserts such devices are as discussed above in the micron range. Hence the prior art as cited related to Gorelik applies. PHOSITA asserts that a synapse is part of a neuron.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and submits that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 apply equally against the rejection to claim 7 ***(claim 8 ??)*** under 35 U.S.C. 103. The Applicant also submits that all of the arguments against the rejection to claim 5 apply equally to the rejection to claim 7. ***(claim 8 ??)***

The language reproduced above from Gorelik provides absolutely no teaching or suggestion of nanoparticles as taught by Applicant's invention. Nanoparticles are a fundamental claim limitation of Applicant's claim 8. The charge carrying semiconductor device of Gorelik does not comprise semi-conducting molecular connections as .ht by Applicant's invention. The semi-conducting molecular connections of Applicant's invention are disposed in a solution. The Examiner asserted that nanoparticles are the atoms and molecules maintaining connections at the nanometer scale, such as the atoms at the border of the n-type and p-type wells common in semi-conducting devices. Gorelik does not explain, however, how such atoms at the border of the n-type and p-type wells common in semiconducting devices can be utilized to construct nanometer scale devices, such as physical neural network of Applicant's invention. The use of n-type and p-type wells does not Involve molecular technology (including nanotechnology) as taught by Applicant's specification and claims, but instead relates to a teaching of the fabrication and processes for CMOS technology (which is not nanotechnology). The "atoms and molecules maintaining connections" as indicated by the Examiner involves CMOS fabrication and is simply not a teaching of molecular technology (nanotechnology) as taught by Applicant's invention.

The Applicant submits that the rejection to claim 8 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill In the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 8, including all of the claim limitations of the claim(s) from which

claim 8 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Gorelik nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, In effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further falls to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 8 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 9 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1

(Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). The applicant's specification treats "nanotubes, nanowires, etc." as nanoparticles (specification, page 77, line 3 and PHOSITA asserts such devices are as discussed above in the micron range. Hence the prior art as cited related to Gorelik applies.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 11 under 35 U.S.C. 103. As Indicated previously, McHardy provides no teaching for nanometer scale components, nanotechnology and molecular technology, particularly in the dipole-induced aggregation of nanoparticles. Also, as indicated previously, McHardy does not provide for a teaching of a neural network, but teaches only a synapse for use in a neural network, rather than a neural network itself. Similarly, Nunally at C 1-7, and particularly C 4, L 58 through C 5, L 8, does NOT provide for any teaching of molecular technology (including nanotechnology) as taught by Applicant's specification and claims. FIGS. 1-12 describe a neural system based on very large scale (as opposed to nanometer-scale) Integrated components such as logic gates, MOS, PMOS, transistors and the like.

Nunally represents an example of a traditional hardware (non nanotechnology/molecular technology) approach to neural networks. As indicated above, such traditional approaches are difficult to construct, and in fact as the background section Indicates "a true physical neural network chip, with the learning abilities and connectivity of a biological network, has not yet been designed and successfully implemented." The bottom line is that Nunally does not teach nanotechnology/molecular technology, and in fact due to the use of large scale components such as transistors, PMOS, logic devices, and so forth as a basis for building a neural network, teaches away from manometer-scale components as a basis for forming a true physical neural network such as Applicant's invention.

The Applicant submits that the rejection to claim 11 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 1.1, including all of the claim limitations of the claim(s) from which claim 11 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Nunally nor McHardy provide any teaching or suggestion of molecular technology, Including nanotechnology. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the Invention as claimed. The claims are rejected under 35 U.S.C. §103(x) and no showing has been made to provide the

motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 11 under 35 U.S.C. §103(x) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which Is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(x) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 10 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). Figs. 1-12 of Nunally cites schematic diagrams but have no scale information. Nunally teaches neural

network architecture which can be implemented using the technology of nanodevices as identified by the First Office Action. PHOSITA asserts such devices are as discussed above in the micron or nanotechnology range.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 12 under 35 U.S.C. 103. Additionally, the arguments presented above against the rejection to claim 9 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 12 under 35 U.S.C. 103.

As indicated previously, McHardy provides no teaching for nanometer scale components, nanotechnology and molecular technology. Also, as indicated previously, McHardy does not provide for a teaching of a neural network, but teaches only a synapse for use in a neural network, rather than a neural network itself. Similarly, Nunally at C 1-7, particularly C 2, L 40-46 as well as C 4, L 1-21, do NOT provide for any teaching of Molecular technology (including nanotechnology), particularly the dipole-Induced aggregation of nanoparticles as taught by Applicant's specification and claims.

The Applicant submits that the rejection to claim 12 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill In the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 12, Including all of the claim limitations of the claims) from which claim 12 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Nunally nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(x) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the Invention as claimed. The rejection to claim 12 under 35 U.S.C. §103(x) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which Is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 10 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). Figs. 1-12 of Nunally cites schematic diagrams but have no scale information. Nunally teaches neural network architecture which can be implemented using the technology of nanodevices as identified by the First Office Action. PHOSITA asserts such devices are as discussed above in the micron or nanotechnology range.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection' to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 13 under 35 U.S.C. 103. Additionally, the arguments presented above against the rejection to claim 12 above apply equally against the rejection to claim 13 under 35 U.S.C. 103.

As indicated previously, McHardy provides no teaching for nanometer scale components, nanotechnology and molecular technology. Also, as indicated previously, McHardy does not provide for a teaching of a neural network, but teaches only a synapse for use in a neural network, rather than a neural network itself. Similarly, Nunally at C 1-7, particularly C 4, L 58 through C 5, L a does NOT provide for any teaching of molecular technology (including nanotechnology), particularly the dipole-induced aggregation of nanoparticles as taught bar Applicant's specification and claims. Instead, C 4, L 58 through C 5, L 8 refers to much larger components and devices such as AND gates, OR gates, PMOS, NMOS transistors, lock out gate, capacitors, and the like. Such components do not provide for a teaching of molecular technology-based (including nanotechnology) components used to create a physical neural network. Because neither Nunally nor McHardy teach molecular technology and nanotechnology as taught by Applicant's invention, and in fact teach away from this technology, it would be improper to use McHardy and Nunally as a basis for arguing that such devices teach the molecular technology (including nanotechnology) of Applicant's invention.

The Applicant submits that the rejection to claim 13 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or In the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 13, including all of the claim limitations of the claim(s) from which claim 13 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that neither Nunally nor McHardy provide any teaching or suggestion of molecular technology, including nanotechnology. Third, there is simply no teaching of A H. claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, In effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further falls to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 13 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which Is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 11 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary.

Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). Figs. 1-12 of Nunally cites schematic diagrams but have no scale information. Nunally teaches neural network architecture which can be implemented using the technology of nanodevices as identified by the First Office Action. PHOSITA asserts such devices are as discussed above in the micron or nanotechnology range.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 16 under 35 U.S.C. 103.

The invention described by the Applicant does not, in any way, utilize an electrochemical process. The entire effect of McHardy and Widrow requires the migration of metal ions. To argue that the combination of McHardy and Widrow makes obvious the applicants invention disregards that a completely different physical process Is being utilized.

Regarding the use of increasing an alternating electric field across the connection gap, the Examiner has disregarded the fact that the Invention disclosed by McHardy will not work with an alternating electric field. McHardy states this in the 5th paragraph of the Description of Related Art that:

> "Metal migration is an electrochemical process related to electroplating. Metal migration takes place between conductors in an active electronic circuit in the presence of a moisture film. Under the influence of a DC voltage, metal ions dissolve from the positive conductor (the anode). The dissolved ions migrate through the moisture film (the electrolyte) and plate out on the negative conductor (the cathode). The deposit often takes the form of metallic whiskers which eventually reach the anode and create an ohmic contact."

The AC voltage used in Widrow could not be applied to McHardy because it would have been obvious to one of ordinary skill at the time of Applicant's invention that metal migration cannot be attained with an AC electric current. Based on this fact and also that both Widrow and McHardy describe a device that operates on completely different physical phenomena, The Applicant submits that the rejection to claim 16 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or In the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 16, including all of the claim limitations of the claim(s) from which claim 16 depends. Second, there is not a reasonable expectation of success for such a combination, particularly in light of the fact that Widrow and McHardy do NOT provide any teaching or suggestion of molecular technology, including nanotechnology. In particular, Widrow provides no teaching of nanotechnology AND neural networks. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill In the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 16 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 12 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and

applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Semaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969). The Examiner has full latitude to interpret each claim in the broadest reasonable sense. From McHardy, Fig. 1 a variable control of the voltage is identified. Such voltage can be continuously adjusted from 0 to some value on a periodic basis which constitutes a frequency of being on and off and is yet variable in magnitude. Under the condition when the applicant is operating with a liquid solution, the features of electrochemical are similar ... migration under the presence of an electric field. The teachings of McHardy and Widrow are compatible.
In reference to Applicant's argument:

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 17 under 35 U.S.C. 103. Additionally the arguments presented above against the rejection to claims 2-8 with respect to McHardy/Gorelik apply equally against the rejection to claim 17. Also, the arguments presented above against the rejection to claim 16 with respect to McHardy/Widrow apply equally against the rejection to claim 17.

The Applicant submits that the rejection to claim 17 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either In the references themselves or in the knowledge generally available to one of ordinary skill In the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 17, including all of the claim limitations of the claims) from which claim 17 depends. Both McHardy and Widrow disclose a completely difference physical phenomena. Further, the "gate" of Gorelik is in reference to a neural node, not a synapse. Anybody of ordinary skill in the art at the time of the Applicant's Invention would have been aware that a neuron is not a synapse. The AC voltage used in Widrow could not be applied to McHardy because it would have been obvious to one of ordinary skill at the time of Applicant's invention that metal migration cannot be attained with an AC electric current.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation a$ to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 17 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on pages 13 and 14 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975).

However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Semaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969).

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 18 under 35 U.S.C. 103. Additionally the arguments presented above against the rejection to claims 2-8 with respect to McHardy/Gorelik apply equally against the rejection to claim 18. Also, the arguments presented above against the rejection to claim 16 with respect to McHardy/Widrow apply equally against the rejection to claim 18

The Applicant submits that the rejection to claim 18 fails under all three prongs of the aforementioned prima facie obviousness test. First, there is no suggestion or motivation, either in the references themselves or In the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of Applicant's claim 18, including all of the claim limitations of the claims) from which claim 18 depends. Second, there is not a reasonable expectation of success for such a combination. How could there be a reasonable expectation for such a combination when Widrow describes an electroplating process having no relation the dipole-induced aggregation effect described by the applicant, McHardy describes a metal migration process having no relation the dipole-induced aggregation effect described by the applicant, and Gorelik relates to a teaching of the fabrication and processes for CMOS technology (but not molecular nanotechnology intended for the emulation of a neural node, not a synapse. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner. In addition, the examiner has not provided an explanation for how a polymer dielectric can be considered a solution capable of suspending nanoparticles and allowing the nanoparticles to move around.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. §103(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these

references in order to yield the invention as claimed. The rejection to claim 18 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner advises the applicant that since the prior art of McHardy can be used for each element of claim 3, there is no requirement to follow the format that the applicant asserted on pages 17:19-25 and page 18:1-14 of the applicant's response dated May 23, 2006. All of applicant's comments have been given due diligence above.

In reference to Applicant's argument:

The Applicant respectfully disagrees with this assessment and notes that the arguments presented above against the rejection to claim 1 under 35 U.S.C. 102 (with respect to McHardy) apply equally against the rejection to claim 20 under 35 U.S.C. 103. Additionally the arguments presented above against the rejection to claims 2-8 with respect to McHardy/Gorelik apply equally against the rejection to claim 20. Also, the arguments presented above against the rejection to claim 16 with respect to McHardy/Widrow apply equally against the rejection to claim 20. The Applicant further submits that the arguments presented above against the rejection to claims 11-13 with respect for McHardy/Nunally apply equally against the rejection to claim 20.

The Applicant submits that the rejection to claim 20 fails under all three prongs of the aforementioned prima facie obviousness test, First, there is no suggestion or motivation, either in the references themselves or In the knowledge generally available to one of ordinary skill in the art, to combine the reference teachings as argued by the Examiner to teach each and every claim limitation of, Applicant's claim 20, including all of the claim limitations of the claims) from which claim 20 depends. Second, there is not a reasonable expectation of success for such a combination. How could there be a reasonable expectation for such a combination when Widrow does not teach nanotechnology or neural networks, Both McHardy and Widrow disclose a completely difference physical phenomena. The AC voltage used in Widrow could not be applied to McHardy because it would have been obvious to one of ordinary skill at the time of Applicant's invention that metal migration cannot be attained with an AC electric current. McHardy does not provide for a teaching of nanometer scale components, and Gorelik relates to a teaching of the fabrication and processes for CMOS technology (but not molecular nanotechnology) Intended to emulate a neural node, not a synapse. Anybody of ordinary skill in the art at the time of the applicant's invention would have been aware that a neuron is not a synapse. Nunally does not provide for any teaching of molecular technology (including nanotechnology) as taught by Applicant's _specification and claims. Instead, Nunally refers to much larger components and devices such as AND gates, OR gates, PMOS, NMOS transistors, lock out gate, capacitors, and

the like. Third, there is simply no teaching of all the claim limitations by the references when combined as argued by the Examiner.

Regarding the issue of motivation, the Applicant reminds the Examiner that the language of the references may not taken out of context and combined without motivation, in effect producing the words of the claims (and sometimes, not even the words or concepts of the claims), without their meaning or context. The resultant combination would not yield the invention as claimed. The claims are rejected under 35 U.S.C. gip3(a) and no showing has been made to provide the motivation as to why one of skill in the art would be motivated to make such a combination, and further fails to provide the teachings necessary to fill the gaps in these references in order to yield the invention as claimed. The rejection to claim 20 under 35 U.S.C. §103(a) has provided no more motivation than to simply point out the individual words of the Applicant's claims among the references, but without the reason and result as provided in the Applicant's claims and specification, and without reason as to why and how the references could provide the Applicant's invention as claimed. Hindsight cannot be the basis for motivation, which Is not sufficient to meet the burden of sustaining a 35 U.S.C. §103(a) rejection.

Examiner's response:

¶ 19. applies. Above discussions apply. Examiner asserts that the motivation set forth on page 17 of the First Office Action dated April 24, 2006 is sufficient since the applicant has not given any factual evidence to the contrary. Again Examiner asserts reasonable expectation based on the cited prior art and applicant has not cited factual evidence to the contrary. Finally, Examiner recognizes that references cannot be arbitrary combined and that there must be some reason why PHOSITA would be motivated to make the proposed combination of references. In re Nomiva, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not to make the modification expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to PHOSITA. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughin, 170 USPQ 209 (CCPA 1971). References

are evaluated by what they suggest to PHOSITA, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969).

Examination Considerations

16. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris,* 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

17. Examiner's Notes are provided with the cited references to prior art to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and spirit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but a link to prior art that one of ordinary skill in the art would find inherently appropriate.

18. Unless otherwise annotated, Examiner's statements are to be interpreted in reference to that of one of ordinary skill in the art. Statements made in reference to the condition of the disclosure constitute, on the face of it, the basis and such would be obvious to one of ordinary skill in the art, establishing thereby an inherent prima facie statement.

19. Examiner's Opinion: ¶¶ 16-18 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

22. Claims 1-20 are rejected.

Correspondence Information

Any inquiry concerning this information or related to the subject disclosure should be directed to the Primary Examiner, Joseph P. Hirl, whose telephone number is (571) 272-3685. The Examiner can be reached on Monday – Thursday from 6:00 a.m. to 4:30 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, David R. Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

Receptionist,

Customer Service Window,

Randolph Building,

401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

or faxed to:

(571) 273-8300 (for formal communications intended for entry.

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Joseph P. Hirl
Primary Examiner
July 13, 2006